

1725

## REISSUE LITIGATION

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MAY 10 2004

REISSUE LITIGATION

Raymond Degner et al.

Reissue Appn. 10/734,073 Filed Dec. 12, 2003

For: COMPOSITE ELECTRODE FOR PLASMA

Protector: Xycarb Ceramics, Inc.

Attorney Docket: 01-9665-06.4 Attorney: John E. Wagner  
(818) 957-3340

OFFICIAL

**Fax**

**To:** Director, Technology Center 1700    **From:** John E. Wagner, Reg. No. 17496  
**Group Art Unit 1744**

<b>Company:</b>	USPTO	<b>Pages:</b>	29 (Including cover sheet)
<b>Fax:</b>	703 872-9306	<b>Date:</b>	May 10, 2004
<b>Re:</b>	Protest to the Reissue of U.S. Patent 5,074,456.	<b>Our Docket:</b>	01-9665-06.4

**Urgent**     **For Review**     **Please Comment**     **Please Reply**

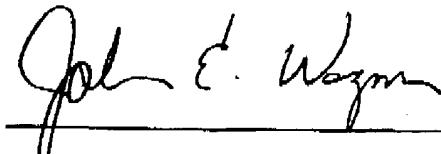
Enclosed is the Protest of Xycarb Ceramics, Inc. under 37 CFR 1.291(a) to the Reissue of U.S. Patent, 5,074,456. The full copy, including all references, are filed this day at the Customer window by our Washington associate, Dennis Kreps, 703 413-6616, who attempted delivery to the Technology Center in accordance with the rules for Protest filing in litigation. Enclosed herewith are the following excerpts from the full Protest:

Protest	(6 pages)
Information Disclosure Statement	(1 page)
First page of References A-K	(14 pages)
Listing of Claim Comparison Sheets	(5 pages)
Proof of Service On Opposing Counsel	(2 page)

An additional copy is being faxed to SPE Tom Dunn at Fax 571/273-1171.

## CONFIDENTIALITY NOTE

The information transmitted in this facsimile message is sent by an attorney or his/her agent, is intended to be confidential and for the use of only the individual or entity named above. If the recipient is a client, this message may also be for the purpose of rendering legal advice and thereby privileged. If the reader of this message is not the intended recipient, you are hereby notified that any retention, dissemination, distribution or copy of this telecopy is strictly prohibited. If you have received this facsimile in error, please immediately notify us by phone and return the original message to us at the address above via the mail (we will reimburse postage). Thank you.



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 Raymond Degner et al.  
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 For: COMPOSITE ELECTRODE FOR PLASMA  
 Protester: Xycarb Ceramics, Inc.  
 Attorney Docket: 01-9665-06.4 Attorney: John E. Wagner  
 (818) 957-3340

Patent  
 Attorney Docket No. 01-9665-06.4

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Reissue Patent Application of	)	
Raymond DEGNER et al.	)	
Application No.: 10/734,073 (Reissue)	)	Group Art Unit: 1744
Filed: December 12, 2003	)	Examiner (Unknown)
For: COMPOSITE ELECTRODE FOR	)	Status: Published March 9, 2004
PLASMA PROCESSES	)	Attention: Director, Technology
	)	Center 1700

**PROTEST OF XYCARB CERAMICS, INC.  
 UNDER 37 C.F.R. 1.291(a)  
 TO THE REISSUE OF U.S. PATENT 5,074,456**

Commissioner for Patents  
 P.O. Box 1450  
 Alexandria, VA 22313-1450

Sir:

Xycarb Ceramics, Inc., a Texas corporation, with a principal place of business at 101 Inner Loop Road, Georgetown, Texas 78626, hereby protests the reissue application of U.S. Patent 5,074,456, (hereinafter Degner '456 Patent) by its owner of record, LAM Research Corporation. The Protest extends to the unpatentability of all 36 claims of the reissue application, in view of the prior art accompanying this Protest. The Degner '456 Patent, as noted in the Reissue Application, is the subject of litigation

**REISSUE LITIGATION**

between the parties to this Protest in the U.S. District Court, Northern District of California, Case 3:03-cv-01335.

Enclosed is Protester's Information Disclosure Statement (PTO 1449) listing 11 U.S. patents and 1 publication which, individually or in various combinations, are believed to clearly render each of the claims of the Degner '456 Patent invalid under 35 U.S.C. 102(b), 103 or 112, 2nd paragraph. Copies of the 11 patents, along with a reproduction of the cover title page, copyright page, introductory pages, and Chapter 5 of the book McGuire, SEMICONDUCTOR MATERIALS AND PROCESS TECHNOLOGY HANDBOOK, For Very Large Scale Integration (VLSI) and Ultra Large Scale Integration (ULSI), © 1988, are enclosed as prior art references A-K.

A concise explanation of the relevance of each listed prior art reference is presented in the attached CLAIM COMPARISON SHEETS. Each CLAIM COMPARISON SHEET reproduces one or more claims of the Degner '456 Patent on the left-hand side, with the relevant language of each prior art reference and corresponding marked-up drawings on the right-hand side, along with the Protester's conclusions or reasons for the relevance.

The reason for combining more than one claim of the Degner '456 Patent on one sheet or a series of sheets is the fact that the claims are so numerous in the patent that

**REISSUE LITIGATION**

many of them, mainly the dependent claims, are identical or nearly identical in content. For example, claims 2 through 17 are dependent upon claim 1, and claims 19 through 32 are dependent upon claim 18, but the contents of these two dependent series of claims are identical or nearly identical. This form of presentation is believed to facilitate the necessary examination of all these claims.

It is noted that only two claims of the Degner '456 Patent, 18 and 33, were indicated by the Reissue Applicant to be involved and requiring reexamination in the reissue process. Those two claims, 18 in particular and 33, as now admitted to be invalid, are the principal claims being asserted by the Reissue Applicant in the District Court litigation, along with all of the other claims of the Degner '456 Patent.

**CONSIDERATION OF PROTESTOR'S  
ARGUMENTS PER MPEP 1901.06**

Protestor submits herewith Attachments I, II, III and IV, which are documents filed by the Reissue Applicant, LAM Research Corporation, in the pending District Court, litigation referenced above. These include clear judicial admissions by the Reissue Applicant of the particular pertinence of U.S. Patent 4,385,979 to Pierce et al (hereinafter Pierce '979 Patent). The Reissue Applicant asserted in the litigation that the Pierce '979 Patent clearly teaches shrink fitting of an electrode to its support for use in plasma processing systems. This admission clearly invalidates claims 1, 18, 33, 34,

**REISSUE LITIGATION**

35, and 36 of the Degner '456 Patent.

A further need for the careful review of each of the claims of the Degner '456 Patent is the fact that the Reissue Applicant is asserting vigorously in the pending District Court litigation that the Degner '456 Patent discloses and claims "bonding" of the electrode to its supporting ring "may be by any suitable process", including shrink fit. See Attachment III, Page 5, lines 4-28. That interpretation flies in the face of the numerous prior art references, References A-K, provided by the Protester, which reflect the many forms of electrode bonding well known in exactly the same art before the Reissue Applicant's perceived invention.

The only difference between the Degner '456 Patent and the Pierce '979 Patent is that in the Degner '456 Patent, the electrode is of substantially uniform thickness, whereas in the Pierce '979 Patent, the electrode is shaped. In this field, flat electrodes are typically used in etching systems, whereas shaped electrodes are used in deposition systems. However, Degner '456 Patent states that its electrode bonding system may be used in either etching or deposition systems. See Degner '456 patent, Abstract, sentence 1 and Col. 1, lines 6-11.

As a further ground for this Protest, it is submitted that the error in claim 18, which gives rise to the Reissue Application, and the error in claim 33, likewise amended

**REISSUE LITIGATION**

to overcome an error, were of the type that were apparent on their face as soon as the Degner '456 Patent issued in 1991. Thirteen years later Reissue is sought. The Reissue Applicant brought suit for infringement and asserted claim 18 vigorously as enforceable at least six months before this Reissue Application was filed. At that time, the Reissue Applicant relied upon the Pierce '979 Patent in reality to support a broadened claim construction covering any form of bonding of plasma electrodes to their support, well beyond the two-year limit for a broadening reissue. The Pierce '979 Patent, our Ref. A, is believed to invalidate claim 18 as well as all other claims under 35 U.S.C. 102(b) alone or under 35 U.S.C. 103 in combination with the other references cited by the Protester.

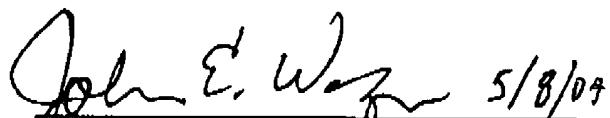
In this Protest, relevant prior art patents are identified by the full patent number and name on the Information Disclosure Statement. Thereafter, they are also designated by Protester's reference designations of Ref. A and C through K, as well as inventor's name and last three digits of the patent number, for example, Ref. A Pierce et al. '979.

References to rejection of several claims under 35 U.S.C. 112 are indicated to mean that the claims lack definiteness or are unallowable Markush-type claims, for example, claims 16, 30, and 35. MPEP 2173.05 (h) or original claims 18 and 33 MPEP 2173.05(a).

**REISSUE LITIGATION**

It is requested that in Reissue prosecution, that the Examiner carefully considers References A-K, apply them to the claims and reject claims 1-36 of the Degner '456 Patent.

Respectfully submitted,



John E. Wagner 5/8/04

John E. Wagner, Reg. No. 17,496  
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Litigation Co-Counsel With

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Enclosures:

I:\U\TX\carb\lawn\06.4.PROTEST

**INFORMATION DISCLOSURE CITATION**  
*(Use several sheets if necessary)*

Docket Number (Optional) <b>01-9665-06.4</b>		Application Number <b>10/734,073</b>
Applicant(s) <b>Degner et al.</b>		
Filing Date <b>Dec. 12, 2003</b>	Group Art Unit	<b>Unknown</b>

**U.S. PATENT DOCUMENTS**

EXAMINER INITIAL	REF	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
A		<b>4,386,979</b>	5/31/83	Pierce et al.	204	298	
B		See Below					
C		<b>4,564,435</b>	1/14/86	Wickersham	204	298	
D		<b>4,931,135</b>	6/5/90	Horiuchi et al.	156	643	
E		<b>4,820,371</b>	4/11/89	A. D. Rose	156	345	
F		<b>4,904,621</b>	2/27/90	Loewenstein	437	225	
G		<b>4,367,114</b>	1/4/83	Steinberg et al.	156	643	
H		<b>4,297,162</b>	10/27/81	Mundt et al.	156	643	
I		<b>4,963,713</b>	10/16/90	Horiuchi et al.	219	121.45	1/18/99
J		<b>4,792,378</b>	12/20/88	Rose et al.	156	643	
K		<b>4,544,091</b>	10/1/85	Hidler et al.	228	124	

**FOREIGN PATENT DOCUMENTS**

REF	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	Translation	
						YES	NO

**OTHER DOCUMENTS** *(Including Author, Title, Date, Pertinent Pages, Etc.)*

B		McGuire, SEMICONDUCTOR MATERIAL AND PROCESS TECHNOLOGY HANDBOOK, FOR VERY LARGE SCALE INTEGRATION (VLSI) AND ULTRA LARGE SCALE INTEGRATION (ULSI). Copyright 1988, Noyes Publications, Chapter 5, Particularly Pages 272-279, Fig. 51a(l)

EXAMINER	DATE CONSIDERED

EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP Section 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

**REISSUE APPLICATION****CLAIM COMPARISON SHEETS**

**Concise Descriptions of Relevance Are Found On  
Each Claim Comparison Sheet**

**REFERENCES AND BASES FOR REJECTION**

1. Claims 1 and 18 Ref. A Pierce '979 (Figs. 3a, 3b, and 3c)  
35 U.S.C. 102 (b) or 103 (electrode not flat)
2. Claims 1 and 18 Ref. A Pierce '979 (Figs. 4a, 4b, 5, and 6 plus)  
Ref. B McGuire 35 U.S.C. 103
3. Claims 1 and 18 Ref. A Pierce '979 plus Ref. D Horiuchi '135 (Fig. 1)  
35 U.S.C. 103
4. Claims 1 and 18 Ref. A Pierce '979 plus Ref. D Horiuchi '135 (Fig. 14)  
35 U.S.C. 103
5. Claims 1 and 18 Ref. G Steinberg '114 35 U.S.C. 102(b)
6. Claims 1 and 18 Ref. A Pierce '979 plus Ref. H Mundt '162 35 U.S.C. 103
7. Claims 1 and 18 Ref. A Pierce '979 plus Ref. I Horiuchi '713 (Fig. 1)  
35 U.S.C. 103 or 102
8. Claims 1 and 18 Ref. A Pierce '979 plus Ref. I Horiuchi '713 (Fig. 6)  
35 U.S.C. 103
9. Claims 1 and 18 Ref. A Pierce '979 and/or Ref. J Rose '378 (Fig. 1)  
35 U.S.C. 103 or 102(b)
10. Claims 1 and 18 Ref. A Pierce '979 plus Ref. K Hidler '091 (Figs. 1 and 2)  
35 U.S.C. 103

## REISSUE APPLICATION

11. Claim 2 Ref. D Horiuchi '135 (Figs. 1 and 14)  
35 U.S.C. 102(b) or 103

12. Claim 2 Ref. I Horiuchi '713 (Figs. 1 and 6)  
35 U.S.C. 102(b) or 103

13. Claim 2 Ref. G Steinberg et al. '114 35 U.S.C. 102(b) or 103

14. Claims 3, 4 and 19 Ref. B McGuire or Ref. D Horiuchi '135 (Fig 1)

15. Claims 3, 4 and 19 Ref. D Horiuchi '135 (Fig. 14) or Ref. F (Fig. 30c)  
35 U.S.C. 103

16. Claims 3, 4 and 19 Ref. H Hidler '091 (Figs. 4 and 5) 35 U.S.C. 103

17. Claims 3, 4 and 19 Ref. I Horiuchi '713 (Figs. 1 and 6)

18. Claim 5 Ref. A Pierce '979 (Figs. 3a, 3b, and 3c) Ref. B ( Fig. 51aiii)  
35 U.S.C. 102(b) or 103

19. Claim 5 Ref. A Pierce '979 (Figs. 4a, 4b, particularly 5 and 6)  
35 U.S.C. 102(b) or 103

20.. Claim 5 Ref. B McGuire (Figs 3a, 3b and 3c; Fig. 51aiii)  
35 U.S.C. 103

21. Claim 5 Ref. C Wickersham (Figs. 1, 2 and 3) 35 U.S.C. 103

22. Claim 5 Ref. D Horiuchi '135 (Figs. 1 and 14) 35 U.S.C. 102(b)

23. Claim 5 Ref. F Loewenstein '621 (Fig. 30c) 35 U.S.C. 103

24. Claim 5 Ref. I Horiuchi '713 (Figs 1 and 6)  
35 U.S.C. 102(b) or 103

25. Claims 6 and 20 Ref. C Wickersham '435 (Figs. 1, 2 and 3) 35 U.S.C. 102(b) or 103

## REISSUE APPLICATION

26. **Claims 7 and 21** Ref. A Pierce '979 (Figs. 3a, 3b, and 3c)  
35 U.S.C. 102(b) or 103
27. **Claims 7 and 21** Ref. A Pierce '979 (Figs 4a and 4b)  
35 U.S.C. 102(b) or 103
28. **Claims 7 and 21** Ref. D Horiuchi '135 (Figs. 1 and 14)
29. **Claims 7 and 21** Ref. G Steinberg '114 (The figure) 35 U.S.C. 102(b)
30. **Claims 8 and 22** Ref. F Loewenstein '621 or Ref. H Mundt '162 (see chart)  
35 U.S.C. 103 or 112
31. **Claims 8 and 22** Ref. I Horiuchi '713 (see chart) 35 U.S.C. 103 or 112
32. **Claims 8 and 22** Degner '456 admissions, Col. 4, lines 21-25I 35 U.S.C. 112
33. **Claims 9 and 23** Degner '456 admissions, Col. 5, lines 18-23 35 U.S.C. 112
34. **Claims 10 and 24** Ref. A Pierce '979, Figs. 3a-6, Elements 215, 315, 415, 515,  
and 615 35 U.S.C. 103
35. **Claims 10 and 24** Ref. K Hidler '091, Figs. 1 and 2 bonding layer 16  
35 U.S.C. 102(b) and 103
36. **Claims 11 and 25** Ref. A Pierce '979 alone or with Ref. K, Hidler '091 (see  
chart) 35 U.S.C. 102(b) or 103
37. **Claims 12, 25 and 26** Ref. A Pierce '979 (see chart)  
35 U.S.C. 102(a) or 103
38. **Claims 12, 25 and 26** Ref. K Hidler '091, (Figs 1 and 2) 35 U.S.C. 103
39. **Claims 13 and 27** Ref. A Pierce '979 35 U.S.C. 102(b) or 103

**REISSUE APPLICATION**

40. **Claims 13 and 27** Ref. C, D and K (See Chart) 35 U.S.C. 102.(b) or 103
41. **Claims 14 and 28** Ref. K Hidler '091 (Figs. 1 and 2, Col. 2, lines 29-61)  
35 U.S.C. 102(b)
42. **Claims 15 and 29** Ref. A Pierce '979, (Col. 11, line 44 through  
Col. 12, line 5) 35 U.S.C. 102(b) or 103
43. **Claims 15 and 29** Ref. K Hidler '091 (Figs. 1 and 2 plus Col. 3,  
lines 24-50) 35 U.S.C. 102(b) or
44. **Claims 16 and 30** Ref. A Pierce '979 (Col. 2, lines 29-32 and  
Col. 12, Lines 6-14) 35 U.S.C. 112, 102(b) or 103
45. **Claims 16 and 30** Ref. D Horiuchi '135 (see chart)  
35 U.S.C. 112, 102(b) or 103
46. **Claims 16 and 30** Ref. F Loewenstein '621 (Col. 54, lines 33-36)  
35 U.S.C. 112, 102(b) or 103
47. **Claims 16 and 30** Ref. G Steinberg '114 (The Fig. and Col. 2, lines 57-60)  
35 U.S.C. 112, 102(b) or 103
48. **Claims 17 and 31** Ref. A Pierce 979  
Ref. C Wickersham '435  
Ref. D Horiuchi '135 (see Chart )  
35 U.S.C. 102(b) and 112
49. **Claims 17 and 31** Ref. A Pierce '979 Ref. F Loewenstein '621  
Ref. D Horiuchi '135 (see chart) 35 U.S.C. 102(b) and 112
50. **Claim 32** Ref. A. Pierce '979 (see chart) 35 U.S.C. 102(b)

## REISSUE APPLICATION

51. Claim 32 Ref. C Wickersham '435 (see chart) 35 U.S.C. 102(b)

52. Claim 33 Ref. A. Pierce '979 (see chart) 35 U.S.C. 102(b)

53. Claim 34 Ref. A Pierce '979 (Col. 13, line 67 through Col. 14, line 14  
particularly Col. 14, lines 8-14) 35 U.S.C. 102(b)

54. Claim 35 Ref. A Pierce '979, Col. 2, lines 29-31, Col. 12, lines 6-14  
35 U.S.C. 102(b)

55. Claim 35 Ref. D Horiuchi '135, Col. 12, lines 57-60  
35 U.S.C. 102(b)

56. Claim 35 Ref. F Loewenstein '621 Col. 54, lines 33-36  
35 U.S.C. 102(b), 112

57. Claim 35 Ref. G Steinberg '114, Col. 3, lines 60-63, 35 U.S.C. 102(b)  
103, or 112

58. Claim 36 Ref. A, Pierce et al. '979, Col. 13, line 67, Col. 14, line 28,  
and Figs. 3a, 3b, 3c, 4a, 4b, and particularly Figs. 5 and 6  
35 U.S.C. 102(b)

59. Claim 36 Ref. C Wickersham '435, Col. 6, lines 6-15, Figs. 2 and 3  
35 U.S.C. 102(b)

I:\lit\y\carb\am106.4.CLAIM COMPARISON SHEETS.doc

May 10 04 04:33p

ChemPat KMA&amp;associates

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p. 1

**PROOF OF SERVICE**

I, the undersigned, certify that I am a patent agent associated with the LAW OFFICES OF JOHN E. WAGNER; that I am over eighteen years of age and not a party to the within action; and that my business address is KM ASSOCIATES, 2001 Jefferson Davis Highway, Suite 312, Arlington, VA 22202.

I served the following documents:

1. This transmittal letter with Deposit Account Authorization
2. Power of Attorney
3. Protest Under CFR 1.291(a) (6 pages)
4. Information Disclosure Statement (1 page)

Ref. A 4,385,979	Pierce et al.
Ref. B publication	McGuire (excerpts)
Ref. C 4,564,435	Wickersham
Ref. D 4,931,135	Horiuchi
Ref. E 4,820,371	Rose
Ref. F 4,904,621	Loewenstein
Ref. G 4,367,114	Steinberg
Ref. H 4,297,162	Mundt
Ref. I 4,963,713	Horiuchi
Ref. J 4,792,378	Rose
Ref. K 4,544,091	Hidler
5. Copies of Refs. A-K on the Information Disclosure Statement above
6. Attachments I, II, and III from Case 3:03-cv-01335 Northern District of California
7. Declaration of JW verifying authenticity of Attachments I, II, III, and IV
8. Attachment I  
SUPPLEMENTAL DECLARATION OF PATRICK MICHAEL IN  
SUPPORT OF LAM RESEARCH CORPORATION'S  
APPLICATION FOR TEMPORARY RESTRAINING ORDER
9. Attachment II  
LAM RESEARCH CORPORATION'S REPLY BRIEF IN  
SUPPORT OF APPLICATION FOR TEMPORARY RESTRAINING  
ORDER TO ENJOIN Xycarb Ceramics FROM INFRINGING  
PATENT '456
10. Attachment III  
LAM RESEARCH CORPORATION'S APPLICATION  
FOR TEMPORARY RESTRAINING ORDER TO ENJOIN Xycarb  
Ceramics, Inc. FROM INFRINGING PATENT '456
11. Attachment IV  
McGraw Hill SCIENTIFIC DICTIONARY
12. Listing of CLAIM COMPARISON SHEETS
13. CLAIM COMPARISON SHEETS (57 sheets)
14. Proof of Service on Opposing Counsel

May 10 04 04:33p

ChemPat KMAssociates

703 413 6637

P-2

on the parties stated below, through their attorneys of record, by placing a true copy thereof in a sealed envelope addressed as shown below by the following means of service:

By First Class Mail - I am readily familiar with the firm's practice for collection and processing of correspondence for mailing. Under that practice, the correspondence is deposited with the United States Postal Service on the same day as executed, with first-class postage thereon fully prepaid, in Alexandria, Virginia, for mailing to the office of the addressee following ordinary business practices.

Addressee

Peter K. Skiff  
Burns, Doane, Swecker & Mathis, L.L.P.  
P.O. Box 1404  
Alexandria, VA 22315-1404

I declare under penalty of perjury that the foregoing is true and correct. Executed on

May 10, 2004 at Arlington, VA.

Dennis Kreps  
Dennis Kreps

MAXCOMM/DOCS4/PROOF OF SERVICE

MAY 10, 2004  
REISSUE LITIGATION**LAW OFFICES OF JOHN E. WAGNER**

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**OFFICIAL**

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Attorney Docket: 01-9665-06.4 Attorney: John E. Wagner  
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**Fax**

*PART 2 of fax transmission  
(15 pages) plus copy of  
coversheet  
(16 pages total)*

To: Director, Technology Center 1700 From: John E. Wagner, Reg. No. 17496

Group Art Unit 1744

Company:	USPTO	Pages:	29 (Including cover sheet)
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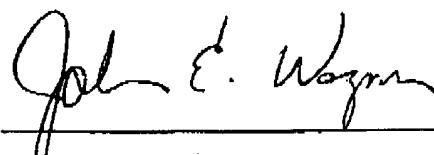
Enclosed is the Protest of Xycarb Ceramics, Inc. under 37 CFR 1.291(a) to the Reissue of U.S. Patent, 5,074,456. The full copy, including all references, are filed this day at the Customer window by our Washington associate, Dennis Kreps, 703 413-6616, who attempted delivery to the Technology Center in accordance with the rules for Protest filing in litigation. Enclosed herewith are the following excerpts from the full Protest:

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Protector: Xycarb Ceramics, Inc.

Attorney Docket: 01-9665-06.4 Attorney: John E. Wagner  
(818) 957-3340

## United States Patent 4,385,979

Pierce et al.

[11] 4,385,979

[45] May 31, 1983

[34] TARGET ASSEMBLIES OF SPECIAL MATERIALS FOR USE IN SPUTTER COATING APPARATUS

[75] Inventors: Denny A. Pierce, Columbus; Joseph A. Heider, Tiberiaske; Roger D. Zell, Mount Sterling, all of Ohio

[73] Assignee: Varian Associates, Inc., Palo Alto, Calif.

[21] Appl. No.: 294,090

[22] Filed: Jul. 9, 1982

[51] Int. Cl. — C23C 15/00

[52] U.S. Cl. — 204/296

[54] Field of Search — 204/296

[36] References Cited

## U.S. PATENT DOCUMENTS

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3,878,083	4/1975	Coronel	204/298
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Primary Examiner: Arthur F. Danner  
Attorney, Agent, or Firm: Stanley Z. Cole; Leo F. Harlow; Robert L. Jepson

## [57] ABSTRACT

In high rate sputter coating sources, it is generally necessary to liquid cool the sputter targets. In one type of source, a cooled wall of a cathode assembly is closely adjacent a sidewall of the sputter target. During normal operation the sidewall of the target expands thermally into tight contact with the cooled wall, whereby cooling of the target is effected without the need for bonding the target to the cooled wall using a solder or other adhesive. Thus, replacement of worn conventional targets is a relatively simple procedure. When the targets are made of certain special materials, such as fragile materials or materials with low coefficients of thermal expansion, target warping, cracking or melting can occur. Such problems are overcome or alleviated by the novel design approach of the present invention, which employs a sputter target assembly in place of a conventional target. The novel sputter target assembly comprises a sputter target of the special material, a retaining member, and a bonding means between the special sputter target and the retaining member. When the special target is worn out, the sputter target assembly is replaced with the same simple procedure used for a conventional target.

15 Claims, 11 Drawing Figures

**REISSUE LITIGATION**

Raymond Degner et al.

Reissue Appl. 10/734,073 Filed Dec. 12, 2003  
 FOR COMPOSITE ELECTRODE FOR PLASMA  
 PROBE; Xycard Ceramics, Inc.

Attorney Docket: 01-9665-06.4 Attorney: John E. Wagner  
 (816) 657-3340

**MATERIALS***Editor*

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**SEMICONDUCTOR MATERIALS****AND****PROCESS TECHNOLOGY**  
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**SEMICONDUCTOR MATERIALS AND  
PROCESS TECHNOLOGY HANDBOOK**

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 Gary E. McGuire

NOTES

NOYES PUBLICATIONS

Table 4b: PECVD of Semiconductors, Conductors, and Elements

Material Deposited	Reactants	Reference
amorphous silicon, a-Si[II]	SiH <sub>4</sub> Si <sub>2</sub> H <sub>6</sub>	246, 256 261
polycrystalline silicon, epitaxial silicon	SiH <sub>4</sub>	278
amorphous germanium, a-Ge[II]	GeH <sub>4</sub>	281
epitaxial germanium	GeH <sub>4</sub>	323
epitaxial GaAs	GeH <sub>4</sub> , AsH <sub>3</sub> (CH <sub>3</sub> ) <sub>2</sub> As, AsH <sub>3</sub>	285
epitaxial GaSb	Ge, Sb	286 287
amorphous carbon, a-C[II]	C <sub>4</sub> H <sub>10</sub> C <sub>2</sub> H <sub>2</sub>	288
amorphous boron, a-B[II]	B <sub>2</sub> H <sub>6</sub> BCl <sub>3</sub> , H <sub>2</sub> BBr <sub>3</sub> , H <sub>2</sub>	326 327 328
amorphous arsenic, a-As[II]	AsH <sub>3</sub>	329
aluminum	AlCl <sub>3</sub> (C <sub>2</sub> H <sub>5</sub> ) <sub>2</sub> Al	380 380
tungsten	WF <sub>6</sub> , H <sub>2</sub>	392
molybdenum	MoF <sub>6</sub> , H <sub>2</sub> MoCl <sub>6</sub> , H <sub>2</sub> Mo(CO) <sub>6</sub>	292 294 293
tungsten silicide	WF <sub>6</sub> , SiH <sub>4</sub>	295
molybdenum silicide	MoCl <sub>6</sub> , SiH <sub>4</sub>	294
titanium nitride	TiCl <sub>4</sub> , N <sub>2</sub> , H <sub>2</sub>	304
titan oxide	(CH <sub>3</sub> ) <sub>2</sub> TiO	318

## REISSUE LITIGATION

Raymond Degner et al.

Reissue Appl. 10/734,073 Filed Dec. 12, 2003

For: COMPOSITE ELECTRODE FOR PLASMA

Protector: Xycarb Ceramics, Inc.

Attorney Docket: 01-9865-06.4 Attorney: John E. Wagner

(818) 957-3340

Table 5: Variable Parameters In PECVD

Direct Variable	Parameter	Typical Value
Reactant Gas Flow	Reactant Gas Flow Rate (also Gas Flow pattern)	1-1000 sccm 1-100
Electrode Spacing	Total Gas Flow	10-5000 sccm
Gas Pressure	RF Power Density	100-2000 mW/cm <sup>2</sup> 0.03 - 0.5 W/cm <sup>2</sup>
RF Frequency	Substrate Temperature	25 KHz - 25 MHz 200 - 400 °C
Results of Variables	Deposition Rate Film Composition Uniformity of Rate and Composition Film Properties	

Similar situations in plasma etching are being treated by Mocella et al.<sup>129</sup> using the statistical technique of Response Surface Methodology to generate a model parametric expression of the process. Such an approach has the potential to drastically reduce the number of experimental data points needed to optimize a multi-parameter process, and therefore its application to PECVD would be very beneficial. Thus deposition parameters may be selected to optimize a specific film property for a given processing application, and the sensitivity of that property to small variations in each parameter established in order to determine the necessary levels of parameter control.

**4.2.1 Reactor Designs.** All plasma deposition systems consist of the following components: gas sources, gas flow controllers, a gas manifold and distributor, a plasma chamber incorporating a heated substrate table and pressure monitoring, an rf generator, a pumping system including throttle valve, and an exhaust system. This is shown schematically in Figure 50. In commercial systems, gas flow control employs electronic mass flow controllers which can maintain absolute flows or fixed flow ratios, pressure monitoring is by species-independent capacitance manometers, and the pumping throttle valve is servo-controlled to maintain a constant chamber pressure. Many systems now employ microprocessor control.

It is the design of the plasma chamber itself, in particular the electrode and gas flow geometries, which distinguishes the various types of PECVD

## REISSUE LITIGATION

Raymond Degner et al.

Reissue Appn. 10/734,073 Filed Dec. 12, 2003  
For: COMPOSITE ELECTRODE FOR PLASMA

Protector: Xycarb Ceramics, Inc.

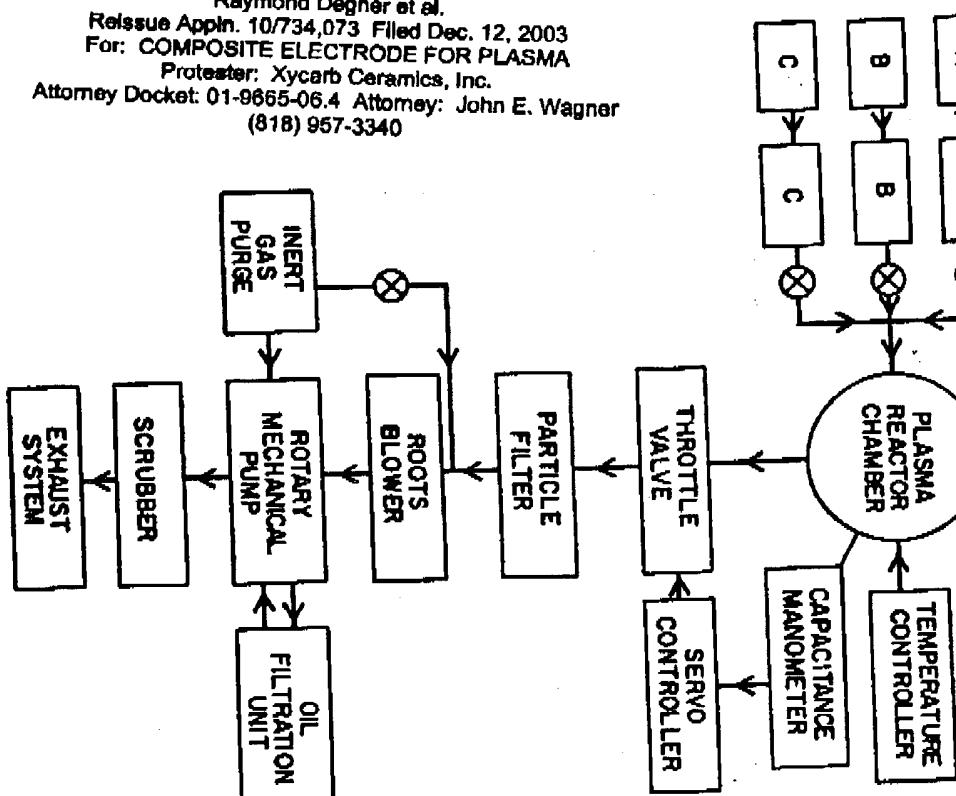
Attorney Docket: 01-9665-06.4 Attorney: John E. Wagner  
(818) 957-3340

Figure 50: Schematic representation of the components of a PECVD system.

reactor. The three main categories are shown schematically in Figure 51, along with the relevant sub-categories. The class (c) shown is to soon exert a subdivision of class (a) in that an individual pair of electrodes is parallel-plate, but since multiple pairs of electrodes distributed in multiple columns along a tube which is enclosed in a diffusion-style furnace is involved, it is a sufficiently different concept to merit separate descriptive treatment.

The parallel-plate, radial flow reactor shown in the first class (a) is designed by A.R. Reinberg, 134,201 for silicon nitride deposition, and sometimes referred to as a Reinberg reactor. His original design (184) employed inward radial flow; a later variation, 222, using outward flow is also shown (185). The radial-flow reactor is the most commonly employed plasma deposition. Electrode diameters are usually in the range of 25 to 40 cm, and batch processing is used. Whereas a single wafer processing has certain merits for plasma etching (see Section 3.2.3), it is not a viable alternative for plasma deposition due to deposition rates (for acceptable film properties) being rather lower than batch rates that can be employed. The larger reactors are normally used for Si processing, and can accommodate about 20 four inch wafers. The smallest reactors are more than adequate for use in present III-V compound semiconductor technology. A typical process time from wafer loading to removal is about two hours, depending on what temperature it is permissible to load wafers onto the substrate. If native oxide growth on the surface of a III-V semiconductor wafer is to be avoided or at least limited, it is necessary that the substrate table be no more than a few tens of degrees above room temperature during wafer loading. This can significantly increase process time, particularly in the case of the larger reactors with substrate tables of large thermal mass. Use of a water carrier plate to give a thermal delay slightly longer than the pump-down time circumvents this problem. The final variety of parallel-plate reactor, shown in Figure 51 as (b) (II), is the "shower head" variety which employs a perforated upper electrode through which the reaction gases are introduced into the plasma. An advantage of this scheme is that the lower electrode (substrate table) is a continuous plate. In contrast to the annular geometry required for radial flow, a disadvantage is the cooling of the perforated, powered electrode is difficult, sometimes necessitating pulsed power plasma operation.

The second type of reactor is the tube or barrel reactor, into which either power usually is inductively coupled by a coil around the tube, externally to the plasma region. This type of reactor is shown as (b) in Figure 51. Capacitive coupling via external electrodes is also possible. As before, the reactor is coldwall. This type of reactor is very simple and lends itself to process research studies, but is not suitable for uniform, batch deposition as needed in a production environment. However, it is particularly suitable for indirect plasma studies in which the substrate is not directly exposed to the plasma, but is mounted downstream from the glow region. In this way reactive radicals and atoms, in both excited and ground states, can arrive at the heated substrate surface if their lifetime is sufficiently long. Since the substrate is in a field-free region, energetic ion and electron bombardment is avoided. This is beneficial for avoiding or restricting substrate

## REISSUE LITIGATION

Raymond Degner et al.

Reissue Appl. 10/734,073 Filed Dec. 12, 2003

For: COMPOSITE ELECTRODE FOR PLASMA

Protester: Xycarb Ceramics, Inc.

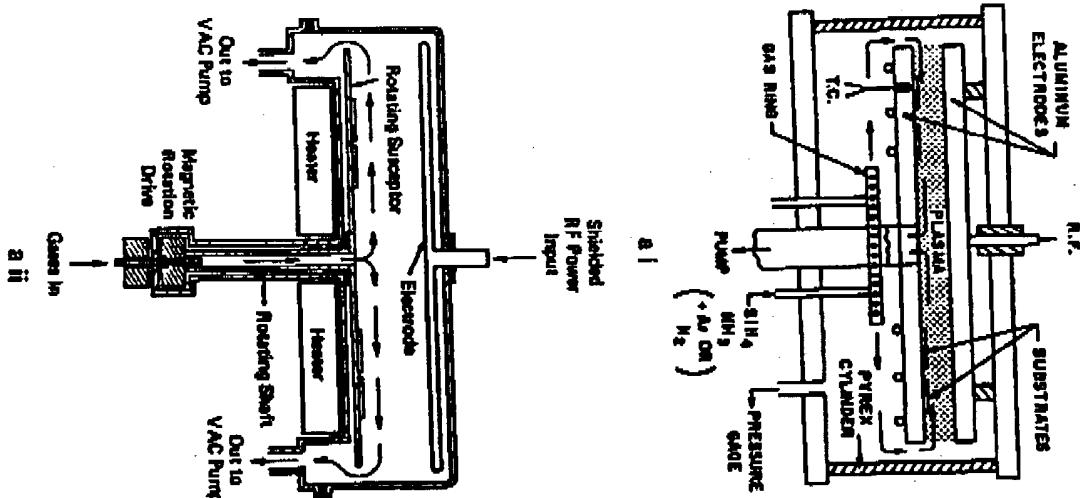
Attorney Docket: 01-9665-06.4 Attorney: John E. Wagner  
(818) 957-3340

Figure 51: The main types of PECVD reactors (a) parallel-plate with (i) Reinberg-design inward radial flow (from Reference 183, reprinted with permission of the American Institute of Physics) (ii) modified Reinberg-design with outward radial flow (from Reference 202, reprinted with permission of Solid State Technology, published by Technical Publishing, a company of Dun and Bradstreet, (iii) shower head gas distribution (b) inductively coupled tube and (c) hot-wall (from Reference 203, reprinted with permission of Solid State Technology, published by Technical Publishing, a company of Dun and Bradstreet).

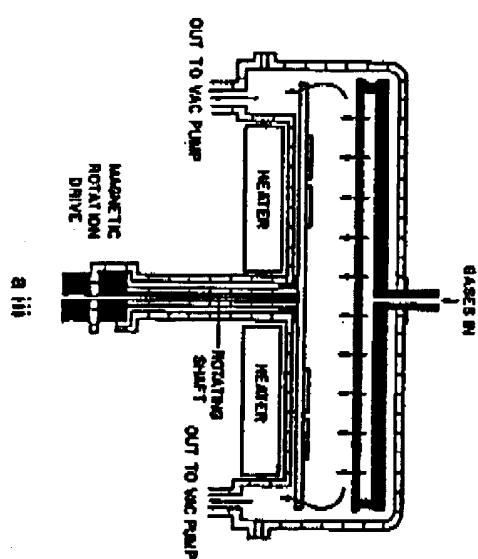
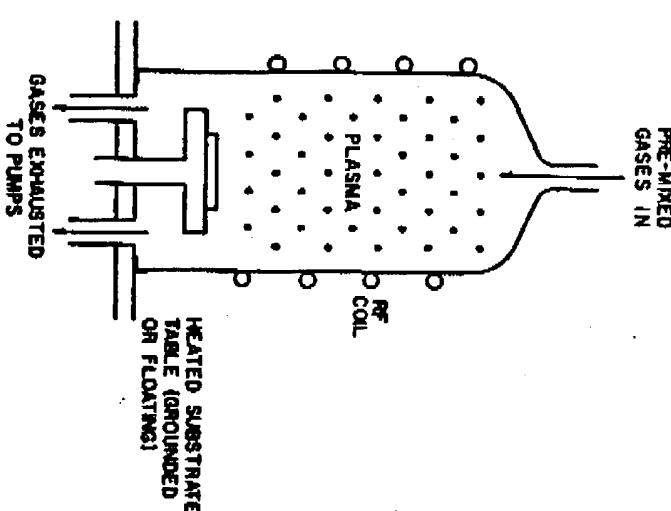
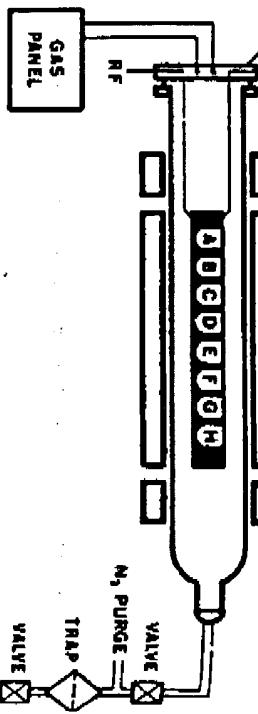
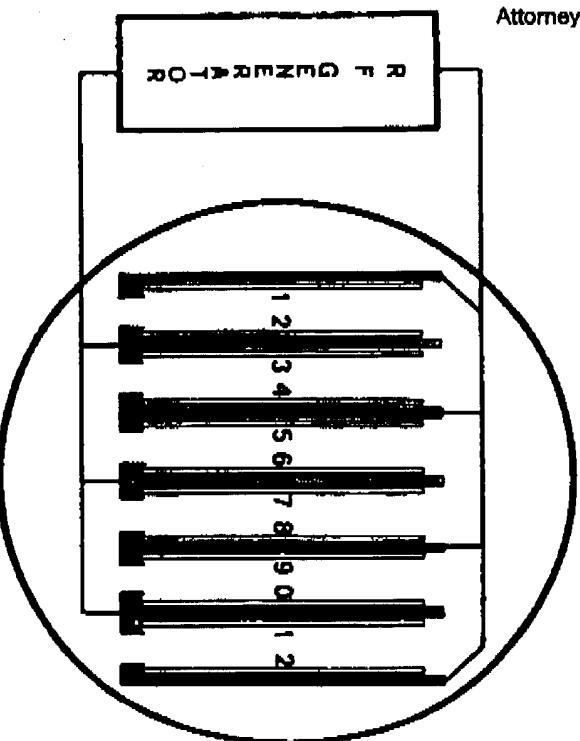


Figure 51: (continued)

REISSUE LITIGATION  
Raymond Degner et al.Reissue Appl. 10/734,073 Filed Dec. 12, 2003  
For: COMPOSITE ELECTRODE FOR PLASMA  
Protector: Xycarb Ceramics, Inc.Attorney Docket: 01-9685-06.4 Attorney: John E. Wagner  
(818) 957-3340PRESSURE SENSOR  
RF  
3 - ZONE RESISTANCE HEATER  
RAY-TRACING PATTERN  
GAS PANEL  
N<sub>2</sub> PURGE  
VALVE  
TRAP  
VALVE  
BLOWER  
VENT

—Side view cross-section of system.



—Front view cross-section of reactor internals.

damage effects, but may not be beneficial to film properties (see Sec. 4.2.4).

The final type of reactor is the hot wall tube, as shown as (c) in Figure 51. This is basically a diffusion furnace tube into which is inserted a multiple array of parallel-plate electrode pairs, usually made of carbon. Each grounded electrode can carry a single wafer in a vertical orientation. This arrangement is suitable for large, regularly shaped Si wafers, but is not suitable for the smaller and often irregularly shaped anisized III-V wafers. An advantage of this arrangement is its large wafer capacity, a commercially available system has a batch capacity of 84 four inch wafers. However in many applications its process cycle time is rather longer than that of the radial flow reactors. Since reactants are introduced at one end of the tube and both become depleted and are accelerated down a pressure gradient (thus reducing residence time) as they flow down the tube, it would appear that the only way to achieve uniform deposition is to use a large excess of reactants and hence operate at low efficiency, a possibly costly operation if very high purity SiH<sub>4</sub> is being used. One variation of this type of reactor<sup>204</sup> pulses the applied rf power to prevent downstream depletion of reactants.

Commercially available PECVD reactors have recently been reviewed.<sup>204</sup> A major reactor design consideration not yet discussed is the frequency of the rf plasma. The frequency range over which reactors have been operated ( $\approx$ 30 KHz to  $\approx$ 30 MHz) can be split into two distinct regimes, as discussed in section 2.1. In one regime, which we will refer to as low frequency rf, both ions and electrons respond to the rf field. Thus in one half-cycle of the applied rf voltage, positive ions are extracted from the glow region and accelerated across the sheath above the substrates on the grounded table. Due to the fairly high pressure employed for PECVD ( $\approx$ 1 torr), most of these ions suffer collisions during acceleration through the sheath. Nevertheless, there is a flux of energetic ions incident on the substrate with an energy distribution whose high energy tail extends as high as the amplitude of the rf voltage, which may be a few hundred volts. This is illustrated in Figure 10. The width of this energy distribution depends on pressure, gas species, rf power etc., and can be as large as a few hundred eV. It is this directional ion flux which is responsible for anisotropy and enhanced etch rates in low frequency plasma etching (see, for example, Reference 140), as discussed in Section 2.2.1. This regime of operation extends up to a few MHz, with the exact upper limit being determined by the ion masses, pressure, etc. Above this transition frequency, we are in the high frequency rf regime, in which the inertia of the ions prevents them from responding to the rf field which is followed only by the electrons. Although there is essentially no energetic ( $> 50$  eV) ion bombardment of the substrate, there remains a high flux of low energy ions ( $\approx 25$  eV), as also shown in Figure 10 due to the small positive dc potential of the glow region. In addition to the energetic electron bombardment. This low energy ion bombardment is also present at low frequency. The difference in extent and energy of ion bombardment fundamentally changes bulk film properties, film/substrate interface properties and in some cases deposition rates.

All the types of reactors discussed can be operated at high or low frequency, although high frequency (13.56 MHz) is generally used for tube

Figure 51: (continued)

**United States Patent [19]**

Wickerham

[11] Patent Number: 4,564,435  
[45] Date of Patent: Jan. 14, 1986

[54] TARGET ASSEMBLY FOR SPUTTERING MAGNETIC MATERIAL

[75] Inventor: Charles E. Wickenshaw, Columbus,  
Ohio

[73] Assignee: Varian Associates, Inc., Palo Alto, Calif.

[21] Appl. No.: 738,305

[22] Filed: May 23, 1985

[51] Int. Cl. .... C23C 14/00  
[52] U.S. Cl. .... 204/298; 204/192 R

[38] Field of Search ..... 204/298, 192 R;  
118/720, 721, 504, 505

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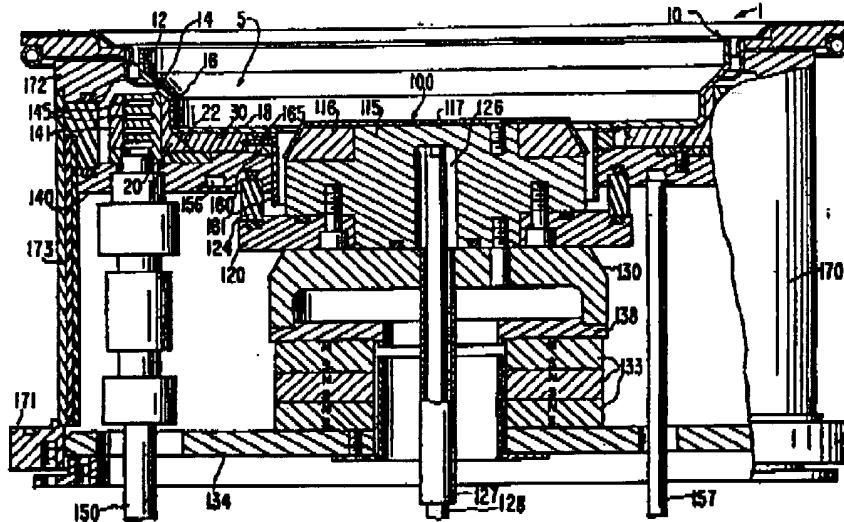
Jrl. of Crystal Growth 45 (1978), 361-364, "High Rate Deposition of Magnetic Films by Sputtering from Two Facing Targets" - Nasé, Hoshi and Yamamoto.  
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*Primary Examiner—Andrew H. Metz  
Assistant Examiner—Nam X. Nguyen  
Attorney, Agent, or Firm—Stanley Z. Cole; David  
Schmand*

[57] ABSTRACT

An optimized annular sputter target assembly for use in sputtering magnetic material, comprising a thin target piece of magnetic material mounted on a backing structure of nonmagnetic material. Said backing structure provides means for easy mounting and removal of the target assembly and for providing good thermal and electrical contact with the cooling wall of the sputter source. The target piece has a portion extending radially outwardly from said cooling wall thereby providing greater target surface area.

**8 Claims, 3 Drawing Figures**



**REISSUE LITIGATION**  
Raymond Degner et al.  
Reissue Appn. 10/734,073 Filed Dec. 12, 2003  
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Protester: Xycard Ceannics, Inc.  
Attorney Docket: 01-565-08-4 Attorney: John E. Wagner  
(818) 957-3340

## REISSUE LITIGATION

Raymond Degner et al.

Reissue Appl. 10/734,073 Filed Dec. 12, 2003  
For: COMPOSITE ELECTRODE FOR PLASMA

Protector: Xycarb Ceramics, Inc.

Attorney Docket: 01-9685-06.4 Attorney: John E. Wagner  
(818) 957-3340

## United States Patent [19]

Horiechi et al.

[11] Patent Number: 4,931,135

[46] Date of Patent: Jun. 3, 1990

## [34] ETCHING METHOD AND ETCHING APPARATUS

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[73] Inventor: Takesi Horiechi, Fuchu, Isamu Arai,  
Yokohama; Yasuhide Takara,  
Yamato, all of Japan[73] Assignee: Tokyo Electron Limited, Tokyo,  
Japan

[21] Appl. No.: 287,185

[22] Filed: Dec. 21, 1990

## [30] Foreign Application Priority Data

Dec. 23, 1987 [JP] Japan 62-323613  
Jan. 24, 1988 [JP] Japan 62-14193  
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C23F 1/00; C03C 15/00

[52] U.S. Cl. 156/643; 156/345;

156/646; 204/192.32; 204/298.35

[54] Field of Search 156/345, 643, 646;

204/298.32, 192.32, 192.35, 192.37; 427/38, 39;

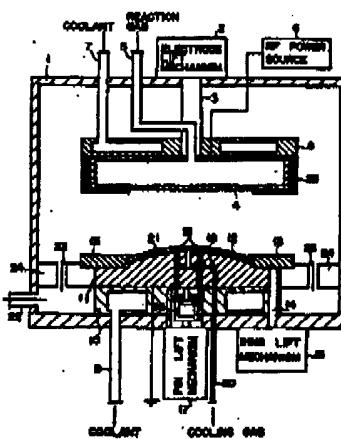
118/50.1, 620, 724

Primary Examiner—William A. Powell  
Attorney, Agent, or Firm—Oblin, Spivak, McClelland,  
Moser & Neustadt

## [57] ABSTRACT

A mounting surface of an electrode for mounting an object to be processed thereon is projected to be a curved surface identical to a curved surface obtained by deforming the object to be processed by a uniform load, and etching of the object to be processed is performed. Etching of the object to be processed can be easily and stably performed, thereby improving yield and productivity.

21 Claims, 19 Drawing Sheets



## REISSUE LITIGATION

Raymond Degner et al.

Reissue Appn. 10/734,073 Filed Dec. 12, 2003

For: COMPOSITE ELECTRODE FOR PLASMA

Protector: Xycarb Ceramics, Inc.

Attorney Docket: 01-9685-06.4 Attorney: John E. Wagner  
(818) 957-3340

## United States Patent [19]

Rose

[11] Patent Number: 4,820,371

[45] Date of Patent: Apr. 11, 1999

## [34] APERTURED RING FOR EXHAUSTING PLASMA REACTOR GASES

[75] Inventor: Alan D. Rose, Wyke, Tex.

[73] Assignee: Texas Instruments Incorporated, Dallas, Tex.

[21] Appl. No.: 132,306

[22] Filed: Dec. 15, 1987

[31] Int. Cl. 4 B44C 1/22; C23C 14/00

[52] U.S. Cl. 156/348; 118/50.1; 118/620; 118/728; 156/643; 156/646; 204/298

[58] Field of Search 118/728; 50.1, 620; 204/192.12, 192.32, 192.3, 298; 156/345, 643; 646; 427/38, 39

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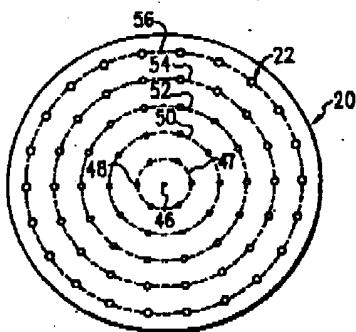
4,590,042 5/1986 Drago 156/343 X

Primary Examiner—William A. Powell  
Attorney, Agent, or Firm—Joseph E. Rogers; James T. Conforti; Melvin Sharp

## [37] ABSTRACT

An annular ring (38) adapted for use in a plasma reaction chamber. The annular ring (38) includes a central opening aperture for laterally retaining a semiconductor slice (40) within the chamber. Spaced around the ring are a plurality of gas exhaust ports (39) for providing a back pressure within the chamber, for removing gases therefrom. Different rings can be provided with different central opening apertures to accommodate the processing of different sized slices. Alternative arrangements of the ring (38) provide for mask openings (68) to mask selected areas of the slices (40) and prevent plasma reactions therest.

18 Claims, 2 Drawing Sheets





REISSUE LITIGATION  
Raymond Degner et al.Reissue Appl. 10/734,073 Filed Dec. 12, 2003  
For: COMPOSITE ELECTRODE FOR PLASMAProtester: Xycarb Ceramics, Inc.  
Attorney Docket: 01-9665-06.4 Attorney: John E. Wagner  
(818) 957-3340

111-121

59

1/17/83

XR

4,367,114

## United States Patent [19]

Steinberg et al.

[11] 4,367,114

[45] Jan. 4, 1983

## [34] HIGH SPEED PLASMA ETCHING SYSTEM

[75] Inventors: George N. Steinberg; Alan R. Steinberg, both of Westport; Jess Della Aya, Stamford, all of Conn.

[73] Assignee: The Perkin-Elmer Corporation, Norwalk, Conn.

[21] Appl. No.: 260,668

[22] Filed: May 6, 1981

[31] Int. Cl. 2 C23C 15/00

[52] U.S. Cl. 156/348; 156/643; 204/192 E; 204/298; 239/145; 219/121 PD; 219/121 PG

[38] Field of Search 156/348, 643; 204/192 E, 298; 222/3; 219/121 PD, 121 PG; 239/145

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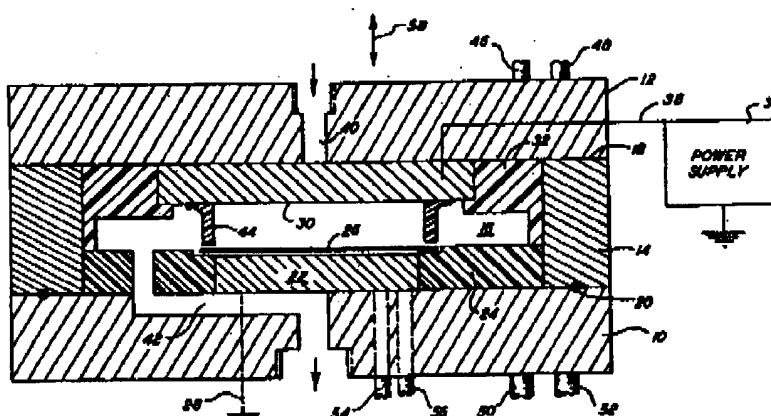
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Crabtree et al, "Plasma . . . A Review," Scanning Electron Microscopy, vol. 1, 1978, pp. 543-554.Primary Examiner—Jerome W. Massive  
Attorneys, Agent, or Firm—S. A. Giarratana; E. T. Grimes; T. P. Murphy

## [57] ABSTRACT

This invention relates to a plasma etching system, which includes a lower flange and a spaced upper flange; a chamber wall mounted between the flanges to form a closed etching chamber; a grounded wafer support plate disposed in said chamber for receiving thereon a wafer to be processed; an electrical insulating element interposed between the chamber wall and the support plate; a sintered, or sintered-like porous electrode plate mounted in the chamber in spaced relationship with respect to the wafer; said plate having a gas inlet for receiving a supply of etching gas; circuitry for applying an excitation voltage to this plate, and said chamber having a gas outlet leading to a vacuum source.

28 Claims, 1 Drawing Figure



## REISSUE LITIGATION

Raymond Degner et al.

Reissue Appl. 10/734,073 Filed Dec. 12, 2003

For: COMPOSITE ELECTRODE FOR PLASMA

Protector: Xycarb Ceramics, Inc.

Attorney Docket: 01-9665-06.4 Attorney: John E. Wagner  
(816) 957-3340

## United States Patent [19]

Maudt et al.

[11] 4,297,162

[45] Oct. 27, 1981

[34] PLASMA ETCHING USING IMPROVED ELECTRODE

[36] References Cited

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[75] Inventor: Randall S. Maudt, Houston; Timothy A. Woodring, Missouri City; Thomas O. Bhagatgama, Houston, all of Tex.

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[73] Assignee: Texas Instruments Incorporated, Dallas, Tex.

Primary Examiner—William A. Powell  
Attorney, Agent, or Firm—John G. Graham

[21] Appl. No. 55,564

## ABSTRACT

[22] Filed Oct. 17, 1979

Radio frequency plasma etching of conductive coatings on semiconductor slices is improved by the use of a curved electrode which is closer to the slice at the center than at the periphery. Preferably, the electrode is in a symmetrical chamber which contains only one slice, and reactive gases are admitted through apertures in the electrode. An r.f. power source is connected between the electrode and a holder for the slice.

[31] Int. Cl. 1 ..... F22D 21/306; C23F 1/00

14 Claims, 5 Drawing Figures

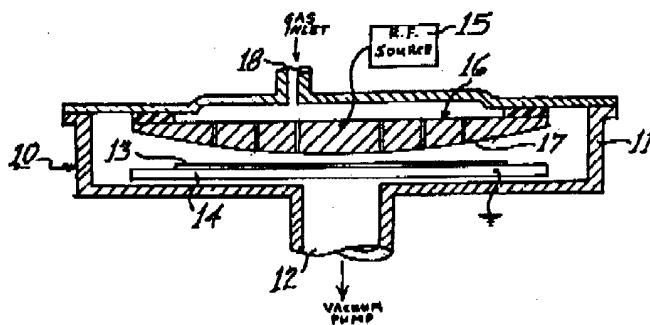
[32] U.S. Cl. 156/643; 156/345;

156/646; 204/192 E; 204/296; 250/331

[33] Field of Search 219/121 PA; 250/531;

250/339; 204/164, 192 EC, 192 E, 296;

156/345, 643, 646, 636, 637; 313/231.3, 348



REISSUE LITIGATION  
Raymond Degner et al.

Reissue Appn. 10/734,073 Filed Dec. 12, 2003  
For: COMPOSITE ELECTRODE FOR PLASMA  
Protector: Xycarb Ceramics, Inc.  
Attorney Docket: 01-9665-06.4 Attorney: John E. Wagner  
(818) 957-3340

**United States Patent [19]**

Rose et al.

[11] Patent Number: 4,792,378

[45] Date of Patent: Dec. 20, 1988

[54] GAS DISPERSION DISK FOR USE IN  
PLASMA ENHANCED CHEMICAL VAPOR  
DEPOSITION REACTOR

[75] Inventor: Alan D. Rose, Wylie, Tex.; Robert M.  
Kennedy, III, Taylors, S.C.

[73] Assignee: Texas Instruments Incorporated,  
Dallas, Tex.

[21] Appl. No.: 132,308

[22] Filed: Dec. 15, 1987

[31] Int. Cl. <sup>a</sup> B44C 1/22; B05B 5/02;  
C23C 14/00; C03C 15/00

[52] U.S. Cl. 118/728; 118/620; 156/345; 156/646;  
204/192.12; 204/298; 427/38

[58] Field of Search 156/345, 643, 646;  
118/728, 50.1, 620; 204/192.12, 192.32, 192.3,  
298; 427/38, 39; 422/186.03, 186.06

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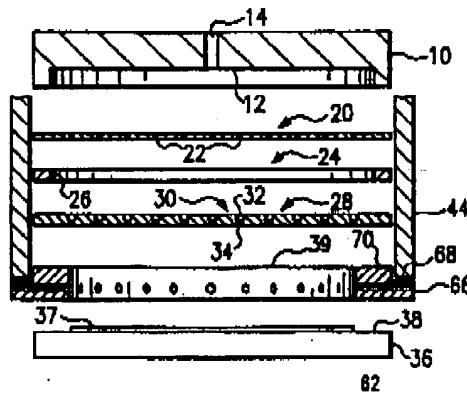
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Primary Examiner—William A. Powell  
Attorneys, Agents, or Firms—Frederick J. Talcley, Jr.;  
Thomas W. DaMond; Malvin Sharp

[57] ABSTRACT

A chemical vapor transport reactor gas dispersion disk (20) for countering vapor pressure gradients to provide a uniform deposition of material films on a semiconductor slice (37). The disk (20) has a number of apertures (22) arranged so as to increase in aperture area per unit of disk area when extending from the center of the disk (20) to its outer peripheral edge.

22 Claims, 1 Drawing Sheet



## REISSUE LITIGATION

Raymond Degner et al.

Reissue Appl. 10/734,073 Filed Dec. 12, 2003

For: COMPOSITE ELECTRODE FOR PLASMA

Protector: Xycarb Ceramics, Inc.

Attorney Docket: 01-9665-06.4 Attorney: John E. Wagner  
(616) 957-3340

## United States Patent [19]

Hiller et al.

[11] Patent Number: 4,544,091

[45] Date of Patent: Oct. 1, 1985

[34] TARGET BONDING PROCESS

[73] Inventors: Henry Hiller, Danvers; Ernest Davy, Peabody; Lawrence L. Hope, Stow; Robert Skinner, Topsham, all of Mass.

[73] Assignee: GTK Products Corporation, Stamford, Conn.

[21] Appl. No.: 617,159

[22] Filed: Jun. 6, 1994

## Related U.S. Application Data

[63] Continuation of Ser. No. 375,625, May 6, 1992, abandoned.

[31] Int. Cl. 4 B33E 31/02

[32] U.S. Cl. 228/134; 228/708;

228/903

[33] Field of Search: 228/903, 121, 122, 124, 228/208, 209

[36] References Cited

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737,144 6/1980 U.S.S.R. 228/124Primary Examiner—Kuang Y. Lin  
Attorney, Agent, or Firm—William H. McNeill; José W. Jiménez

## ABSTRACT

A process for bonding one or more target parts, such as yttrium oxide target parts, to a copper backing plate to provide improved mechanical support and improved heat transfer. The process is one in which a noble metal, preferably platinum, is applied to the target to provide an oxide free layer to which indium/lead solder joints. The solder step is performed so that contamination by flux or by formation of an oxide is prevented.

11 Claims, 2 Drawing Figures

